Use of Alternate Concentration Limits (ACLs) to Determine Cleanup or Regulatory Levels Under RCRA and CERCLA

BACKGROUND: This Information Brief addresses current EPA policies related to Alternate Concentration Limits (ACLs) under RCRA and CERCLA in the establishment of cleanup levels for remedial activities. The brief specifically discusses the regulatory requirements for establishing ACLs and provides examples of where the application of these standards may be appropriate.

STATUTES: Comprehensive Environmental Response, Compensation, and Liability Act, Section121 (Cleanup standards)

REGULATIONS: 40 CFR 264, Subpart F and National Contingency Plan, 40 CFR 300

REFERENCES:

1. OSWER Directive 9481.00-6C, Alternate Concentration Limit Guidance, July 1987.
2. OSWER Directive 9481.00-11. Interim Final, Alternate Concentration Limit Guidance Part II, Case Studies May 1988.
3. EPA-ID: TND980729172. Amnicola Dump. VISTA Environmental Information Inc. Records of Decision. March 30, 1989.
4. EPA-ID: MID062222997, Butterworth # 2 Landfill, MI. ROD Date: September 29, 1992.
5. OSWER Directive 9234.2-25, Guidance for Evaluating the Technical Impracticability of Ground Water Restoration, Interim Final, September 1993. Office of Solid Waste and Emergency Response, Washington, DC.
6. US Department of Energy RCRA/CERCLA Information Brief “Technical Impracticability Decisions for Ground Water at CERCLA Response Action and RCRA Corrective Action Sites. DOE/EH-413/9814. August 1998.
7. OSWER Directive 9200.4-17P. Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, Corrective Action and Underground Storage Tank Sites. April 21, 1999.

What are Alternate Concentration Limits (ACLs)?

Alternate Concentration Limits (ACLs) are risk-based concentration limits that can be used to establish alternate ground water protection standards. Specifically, ACLs are contaminant concentrations that EPA or authorized State agencies determine will not pose a substantial hazard to human health or environmental receptors (given exposure pathways and other factors). ACLs can be established under two different authorities, RCRA or CERCLA. In both cases, ACLs are alternatives to setting ground water protection standards at background concentrations and to using Maximum Concentration Levels (MCLs) or their equivalent as a cleanup or regulatory compliance level. The bases for establishing RCRA ACLs are found in RCRA regulations (40 CFR 264, Subpart F) and in OSWER Directive 9481.00-6C, *Alternate Concentration Limit Guidance*, July 1987.

Use of ACLs is consistent with recently announced results-based reforms of RCRA corrective action as a type of risk-based decision making that the reforms support. CERCLA Section 121(d)(2)(B)(ii) establishes when and how ACLs may be used as part of CERCLA actions, and both the NCP and 1993 guidance describe how ACLs are used in CERCLA actions in contrast to applicable, relevant and appropriate requirement (ARAR) waivers or technical impracticability determinations.

When using ACLs under both CERCLA and RCRA, project managers will have to provide for appropriate public involvement and evaluate and consider any environmental justice issues that use of an ACL may raise. Under RCRA, these will be addressed during permitting or corrective action decision making; under

CERCLA, they will be addressed through the selection of remedy.

When can ACLs be used?

ACLs may be appropriate concentration limits to consider for hazardous constituents in a variety of groundwater contamination scenarios at DOE sites. They are particularly useful for addressing contamination of ground water in situations where it is impracticable or impossible to achieve the existing groundwater protection standards, and when, given the exposure pathways that exist, ACLs can be shown to be protective of human health and the environment.

This information brief outlines (1) the basic regulatory elements of using ACLs, including specific information that is required to seek approval for an ACL under RCRA and CERCLA; and (2) cases and examples where an ACL may be an appropriate standard to consider at DOE sites. These cases are based on actual uses of ACLs as part of remediation and other actions.

ACLs and RCRA

ACLs are established in RCRA regulation as part of the Subpart F requirements (ground water protection) for permitted units. Specific factors (nine for ground water contamination and 10 for surface water pathways (see **Exhibit 1**)) that EPA may consider in establishing an ACL are listed in 40 CFR 264.94(b). *OSWER Directive 9481.00-6C* outlines three basic conditions under which RCRA ACLs may be considered for use:

- Groundwater contamination plumes should not increase in size or concentration above allowable health or environmental exposure levels;
- Increased facility property holdings should not be used to allow a greater ACL; and
- ACLs should not be established so as to contaminate off-site ground water above allowable health or environmental exposure levels.

In order to establish an ACL, two points must be defined: 1) point of compliance; and 2) point of exposure (see **Exhibit 2** for definitions). Understanding and identifying the spatial relationship between these two points is critical to establishing an ACL. Physical or chemical mechanisms that attenuate contaminants may be considered only over the area between the point of compliance and the down-gradient point of exposure. If the points of compliance and points of exposure are set at the same point, the regulatory agency will not allow consideration of attenuation in setting the ACL. However, if the point

Exhibit 1
19 Criteria EPA Regional Administrator Will Evaluate to Establish a RCRA ACL

Potentially Adverse Effects of ACLs on Ground Water, considering:

- Physical and chemical characteristics of waste
- Hydrogeological characteristics of facility
- Quantity of ground water and direction of flow
- Proximity and withdrawal rates by users
- Current and future uses of ground water
- Existing quality of ground water
- Potential for health risks from exposure
- Potential damage to wildlife, crops, vegetation
- Persistence and permanence of adverse effects

Potentially Adverse Effects of ACLs on Hydraulically Connected Surface Water, considering:

- Volume and physical and chemical characteristics of wastes
- Hydrogeological characteristics
- Quantity and quality of ground water
- Patterns of rainfall
- Proximity of regulated unit to surface waters
- Current and future uses of surface water and any water quality standards
- Existing quality of surface water
- Potential for health risks caused by exposure
- Potential damage to wildlife, crops, vegetation
- Persistence and permanence of adverse effects

Source: 40 CFR 264.94(6)
Note: Factors are considered to the degree appropriate for a given facility or circumstance.

Exhibit 2
Definitions of Point of Compliance and Point of Exposure

Point of Compliance- "vertical surface" located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the [regulated] unit. It is the place in the uppermost aquifer where ground water monitoring takes place and the ground water protection standard is set.

Point of Exposure- The point at which it is assumed a potential receptor can come into contact, either now or in the future, with the contaminated ground water. The ground water quality at the point of exposure must be protective of human health and the environment.

Source: OSWER Directive 9481.00-6C

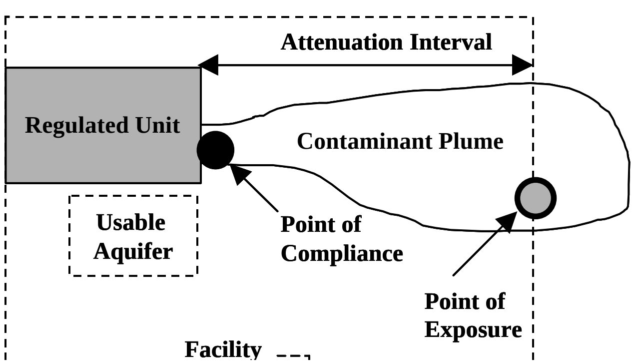
of exposure is separate from the point of compliance, then the regulatory agency will allows an owner/operator to consider appropriate, conservative estimates of contaminant attenuation in calculating the ACL.

For example, EPA guidance **(OSWER Directive 9481.00-6C, page 1-11)** describes a situations where ACLs may be applied. One such scenario involves a hazardous waste management unit located over usable ground water and the leading edge of the plume extends off the facility property, the point of exposure can be assumed to be no farther than the facility boundary. In this case, fate and transport arguments may be applied to ground water contamination between the point of compliance (POC) at the edge of the unit and the point of exposure (POE) (assuming there is no possible route of exposure on the facility property) in calculating the ACL. **(See Exhibit 3)**. ACL determinations in this case can also be based upon contaminant attenuation between the POC and POE, along with maximum allowable concentration limits at the POE.

Additionally, three other examples from EPA's OSWER Directive 9481.00-11 Interim Final Guidance may be used to show the importance of the point of compliance and point of exposure to the establishment of ACLs under RCRA:

<u>Case 1:</u> A facility has no ground water contamination at the time of permit issuance, but is located over a usable aquifer (i.e., the point of exposure is equal to the point of compliance). In this case, the potential point of exposure is assumed to be at the waste management unit boundary. Under this scenario, no-fate and transport arguments can be made since no ground water plume exists at the time of permit issuance, nor can attenuation be assumed for contaminants that leach from a unit in the future.

Exhibit 3
Contamination Extends Beyond Facility Boundary



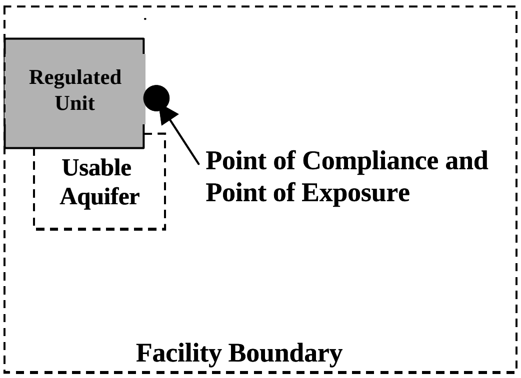
Case 1 diagram on the next page, and OSWER Directive, 9481.00-11). ACLs under this scenario are appropriate **<u>only</u>** if any contamination detected after the time of permit issuance does not exceed maximum allowable concentrations. ACL demonstrations in this case must also include information necessary to select an appropriate point of exposure (POE) contaminant level and determine general ground water use in the vicinity of the facility. Ground water use information should describe the width and depth of the aquifer and a ground water flow description.

<u>Case 2:</u> A facility has contamination in an aquifer and owns the property up to the surface water body. Although the contaminant plume has reached the surface water body, the contaminants do not cause a statistically significant increase over background (uncontaminated) levels in the surface water body, and the contaminants will not reach a receptor at an unsafe level prior to reaching the surface water body. The concentrations of contaminants have been declining and no contaminant in surface water exceeds a water quality standard. **(See Case 2 diagram on the next page, and OSWER Directive, 9481.00-11).** ACLs are appropriate in this situation when they are derived from allowable surface water exposure levels and current levels found in ground water. Under this scenario, specific data on storm events and flooding will be needed to ensure that statistically significant increases of contaminants do not occur in the surface water body. In establishing ACLs, additional information on the physical characteristics and discharge zone of the water body will be necessary, along with current surface water uses.

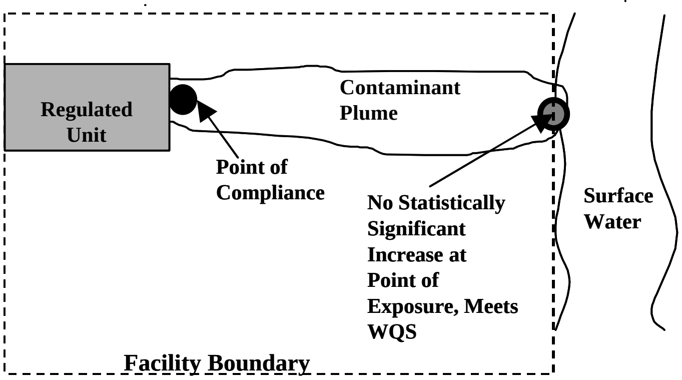
<u>Case 3:</u> A facility is located above an isolated saline aquifer in an arid region in the Western United States. Contamination has not been found in ground water beyond the facility boundary. There are two small communities within 10 miles of the site. There are no residents down-gradient from the site and the land is not used for agriculture or grazing. Ground-water transport is moderately slow and the evapo-transpiration rate exceeds the average precipitation rate. Ground water is suitable for industrial purposes. ACLs may be appropriate in this case when protective of environmental receptors.

ACLs may also be appropriate in this situation when it is shown that the non-potable (saline aquifer) is isolated from any potable aquifer. (**See Case 3 diagram on the next page, and OSWER Directive 9481.00-11**). The permit applicant should also provide information on the ultimate fate of contaminants, uses of local ground waters, and background groundwater quality data demonstrating that the aquifer is non-potable when requesting an ACL in this situation.

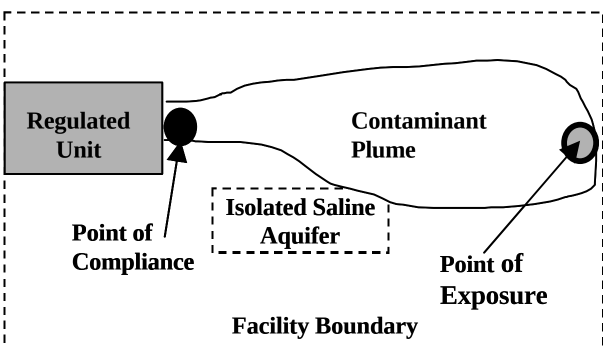
Case 1:



Case 2:



Case 3:



ACLs and CERCLA

CERCLA Section 121 (d)(2)(B)(ii) provides specific language about when ACLs may be considered as part of response actions:

A process for establishing alternate concentration limits to those otherwise applicable for hazardous constituents in ground water may not be used to establish applicable standards… except where (I) there are known and projected points of entry of such ground water into surface water; and (II) there will be no statistically significant increase of such constituents from such ground water into surface water…and (III) the remedial action includes enforceable measures that will preclude human exposure to contaminated groundwater at any point between the facility boundary and all known and projected points of entry of such groundwater into surface water.

Where CERCLA statutory conditions are met, ACLs are one of two possible approaches project managers can consider when MCLs (Maximum Contaminant Limits) or other health based standards may not be appropriate. Another choice is a technical impracticability (TI) determination (e.g., using a CERCLA ARAR waiver).

EPA guidance has established when project managers should consider each option:

Site-specific cleanup levels established as part of an alternative remedial strategy at a Superfund site should not be confused with CERCLA Alternate Concentration Limits (ACLs). To qualify for the use of a CERCLA ACL, the site must meet… three requirements (see above)… In addition, EPA generally considers ACLs appropriate only where cleanup to ARARs is impracticable based on an analysis using the Superfund remedy selection "balancing" and "modifying" criteria [NCP, Section 300.430(f)]. Where an ACL is established, an ARAR waiver is not necessary. Conversely, where an ARAR is waived due to technical impracticability, there is no need to establish a CERCLA ACL. (See Guidance for Evaluating the Technical Impracticability of Ground Water Restoration, Directive 9234-25, September 1993).

This guidance emphasizes the important difference between a determination of "deemed not practicable," based on the remedy selection criteria where an ACL can be considered, and a technical impracticability (i.e., an engineering) determination, where CERCLA approaches other than an ACL are available.

Case Examples Using ACLs in CERCLA Actions

Based on a review of Records of Decision, ACLs have been selected as part of response (remedial) actions in two general types of scenarios:

- As final standards where no exposure to ground water was anticipated; and
- In conjunction with institutional controls.

Each of these examples is discussed below.

ACLs as final cleanup standards:

ACLs under CERCLA may be applied in situations where allowed risk-based concentrations of contaminants that remain at a site are expected to stay stable (i.e., not increase significantly to the point at which levels of hazardous constituents pose a threat to human health or the environment).

At the Amnicola Dump in Chattanooga, Tennessee, for example, ACLs were set as the final cleanup levels for a number of reasons (EPA-ID: TN908720172, ROD- March 30, 1989). First, the treatment of contaminated ground water was not found to be necessary, even though hazardous substances would remain in the ground water above health-based levels. The logic behind this was that there were no ground water users at or down gradient of the Amnciola dump site, and the discharges of ground water from the dump to the Tennessee River would not result in statistically significant increases in contaminant levels within the Tennessee River as a surface water body. Consequently, ACLs were established as final cleanup standards and ground water remediation was not considered further.

ACLs used in conjunction with institutional controls:

EPA has provided guidance (OSWER Directive 9234.2-25, Section 5.1.3, September, 1993) stating that the availability of institutional controls in itself is not sufficient reason to allow levels of contaminants above drinking water standards. Institutional controls are generally not assumed to be the sole remedy, but may be used when other options (e.g., containment) require access controls to maintain protectiveness. ACLs have been used together with institutional control measures, such as deed restrictions or restrictions on water supply use/well construction, to contain the migration of hazardous/toxic substances and to prevent potential environmental and human receptors from coming into contact with contaminants.

The Butterworth landfill site in Grand Rapids, Michigan shows an example of this use of ACLs (EPA-ID: MI062222997, ROD- September 29, 1992). In this case, the primary dangers from contaminants were through ingestion of soil, inhalation of air particles from contaminated material, and dermal contact with the soil itself. State and local environmental officials were also concerned about the risk posed by soil leaching of hazardous materials into ground water discharging into the Grand River.

The remedial solution chosen for this site was designed to prevent actual and potential exposure pathways through the installation of a landfill cap that isolates contaminated soil from human and environmental receptors and prevents soil runoff from entering the nearby Grand River. In conjunction with the cap, institutional controls (ground water access and deed restrictions) were implemented. These institutional and physical measures were coupled with the establishment of ACLs for the site's contaminated ground water. Ground water monitoring was used to ensure that ACLs were not exceeded.

The choice to use ACLs in cooperation with physical containment measures (landfill caps instead of active ground water remediation), was due to the infeasible nature of other remediation measures. Treatment of the principal threats of the site was not found to be practicable because fill material from land filling operations extended into the aquifer throughout the site, making it very difficult to remove contaminants from ground water. A second reason for using ACLs was that contaminated fill from the site extended into the Grand River. Active ground water remediation would have potentially allowed river water to enter the site. Active remediation was therefore ruled out as a potential cleanup option for the Butterworth site.

ACLs and Monitored Natural Attenuation

ACLs may also be appropriate to consider (and have been used) as part of a monitored natural attenuation (MNA) approach for contaminated ground water. An example of appropriate MNA use would be in a situation where a remedy includes source-control, a pump and treatment system to mitigate highly contaminated plume areas, and MNA in the lower concentration portions of the plume. In combination, these methods would maximize groundwater restored to beneficial use in a timeframe consistent with future demand on the aquifer, while utilizing natural attenuation processes to reduce the reliance on active remediation methods and reduce remedy cost. **As was true in this case, use of ACLs may be limited, to being an interim level to be met while natural attenuation is occurring, rather than as a final remediation standard.**

EPA's monitored natural attenuation directive 9200.4-17P, April 21, 1999, makes it clear that monitored and natural attenuation is appropriate only "where its use will be protective of human health and the environment and it will be capable of achieving site-specific remediation objectives within a time frame that is reasonable compared to that offered by other methods, and where it meets the applicable remedy selection criteria (if any) for the particular OSWER program." EPA expects that MNA will be most appropriate when used in conjunction with other remediation measures (e.g., source control, ground water extraction), or as a follow-up to active remediation measures that have already been implemented. Although an ACL must also be "protective of human health and the environment" and allows attenuation as part of its calculation in many cases, ACLs are seldom-appropriate final remediation objectives for sources or potential sources of potable aquifers.

Other Information Resources

- EPA's RCRA/Superfund Hotline
  (800) 424-9346 / (703) 412-9810
- USDOE/ Office of Environmental Policy and Assistance (EH-41) Web Page
  http://www.eh.doe.gov/oepa
- National Technical Information Service
  (800) 553-6847

Questions of policy or questions requiring policy decisions will not be dealt with in EH-413 Information Briefs unless that policy has already been established through appropriate documentation. Please refer any questions concerning the subject material covered in this information brief to Jerry Coalgate, RCRA/CERCLA Division, EH-413, (202) 586-6075.

OFFICE OF ENVIRONMENTAL POLICY & ASSISTANCE • RCRA/CERCLA DIVISION (EH-413) •